CLAIMS

WHAT IS CLAIMED IS:

1. A power converter system, comprising:

a direct conversion frequency changer, implemented as an Unrestricted Frequency Changer or a Matrix Converter, including an input and an output, the frequency changer adapted to accept an input voltage at an input frequency at the input and deliver an output voltage at an output frequency at the output;

an input high bandwidth inverter;

an output high bandwidth inverter;

an inverter controller adapted to calculate harmonics at the input and output of the frequency changer and control the input and output high bandwidth inverters to generate input and output harmonic cancellation signals;

an input harmonic injection transformer connected to the input inverter and the input of the frequency changer to inject said input harmonic cancellation signals; and

an output harmonic injection transformer connected to the output inverter and the output of the frequency changer to inject said output harmonic cancellation signals.

2. The power converter system of Claim 1, wherein the frequency of the output voltage is approximately at or above the frequency of the input voltage.

3. The power converter system of Claim 1, wherein the inverter controller calculates harmonics at the input and output of the frequency changer from a control algorithm selected from the group consisting of: fundamental differential harmonic neutralization by series voltage injection; discrete harmonic neutralization by series voltage injection; and discrete harmonic neutralization by current injection.

4. The power converter system of Claim 1, wherein said frequency changer is implemented as a three-phase to three-phase matrix converter.

5. The power converter system of Claim 1, wherein said high bandwidth inverters have a multilevel cascade H-bridge topology.

6. The power converter system of Claim 1, wherein said high bandwidth inverters have a multilevel diode-clamped inverter topology.

7. A power converter system, comprising:

a frequency changer with an input and an output, the frequency changer adapted to accept an input voltage at an input frequency at the input and deliver an output voltage at an output frequency at the output;

an input high bandwidth inverter;

an output high bandwidth inverter;

an inverter controller adapted to calculate harmonics at the input and output of the frequency changer and control the input and output high bandwidth inverters to generate input and output harmonic cancellation signals;

an input harmonic injection transformer connected to the input inverter and the input of the frequency changer to inject said input harmonic cancellation signals; and

an output harmonic injection transformer connected to the output inverter and the output of the frequency changer to inject said output harmonic cancellation signals, wherein said harmonics calculated by the inverter controller are input and output voltage harmonics.

8. The power converter of Claim 7, wherein said input harmonic injection transformer is in series with said frequency changer.

9. The power converter system of Claim 7, wherein said frequency changer is implemented as an Unrestricted Frequency Changer or a Matrix Converter.

10. The power converter system of Claim 7, wherein the inverter controller calculates harmonics at the input and output of the frequency changer from a control algorithm selected from the group consisting of: fundamental differential harmonic neutralization by series voltage injection; and discrete harmonic neutralization by series voltage injection.

11. The power converter system of Claim 7, wherein said frequency changer is implemented as a three-phase to three-phase matrix converter.

12. The power converter system of Claim 7, wherein said input and output high bandwidth inverters comprise a circuit topology selected from the group consisting of: multilevel cascade H-bridge and multilevel diode-clamped inverter topologies.

13. The power converter system of Claim 12, wherein said input and output high bandwidth inverters include switching frequencies in the range of about 40 kHz to about 50 kHz.

14. A power converter system, comprising:

a frequency changer with an input and an output, the frequency changer adapted to accept an input voltage at an input frequency at the input and deliver an output voltage at an output frequency at the output;

an input high bandwidth inverter;

an output high bandwidth inverter;

an inverter controller adapted to calculate harmonics at the input and output of the frequency changer and control the input and output high bandwidth inverters to generate input and output harmonic cancellation signals;

an input harmonic injection transformer connected to the input inverter and the input of the frequency changer to inject said input harmonic cancellation signals; and

an output harmonic injection transformer connected to the output inverter and the output of the frequency changer to inject said output harmonic cancellation signals, wherein said generated input and output harmonic cancellation signals are narrow band discrete harmonic cancellation signals.

15. The power converter system of Claim 14, wherein said calculated harmonics are voltage harmonics.

16. The power converter system of Claim 14, wherein said calculated harmonics are current harmonics.

17. The power converter system of Claim 14, wherein said input harmonic injection transformer is in series with said frequency changer.

18. The power converter system of Claim 14, wherein said input harmonic injection transformer is in parallel with said frequency changer.

19. The power converter system of Claim 14, wherein said frequency changer is implemented as an Unrestricted Frequency Changer or a Matrix Converter.

20. The power converter system of Claim 15, wherein said frequency changer is implemented as a three-phase to three-phase matrix converter.